Amendments to the Claims

Please amend Claims 1, 3-8, 10-13, 15-19, 22-26, 28-31, 33, 35-38, 40-44, 47-49. Please add new Claims 50-54. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1. (Currently Amended) A method of measuring fullness of a cryopump comprising:

coupling a pressure gauge in fluid communication with [[a]] an inner vacuum region behind a condensing surface, the inner vacuum region including an adsorbent for adsorbing non-condensable gases in [[of]] a cryopump; ~~and~~

measuring pressure of the inner vacuum region with the pressure gauge, the measured pressure being substantially less than the pressure in an outer vacuum region outside of the condensing surface; and

determining an adsorption capacity of the adsorbent using the measured pressure.

2. (Original) A method as in Claim 1 wherein the pressure gauge is an ion gauge.

3. (Currently Amended) A method as in Claim 1 wherein coupling the pressure gauge in fluid communication with the inner vacuum region includes connecting the pressure gauge to a tube or duct leading to the in the inner vacuum region.

4. (Currently Amended) A method as in Claim 1 further including adsorbing gases at the condensing surface, the adsorbed gases consisting substantially of ~~low-boiling-point~~ non-condensable gases.

5. (Currently Amended) A method as in Claim 4 wherein the ~~low-boiling-point~~ non-condensable gases include at least one of hydrogen, helium or neon.

6. (Currently Amended) A method as in Claim 1 wherein the inner vacuum region behind the condensing surface has a pressure which is at least one order of magnitude less than a process chamber coupled to the cryopump.

7. (Currently Amended) A method as in Claim 1 wherein the ~~condensing surface~~ the inner vacuum region further includes an array of baffles coated with an adsorbent.

8. (Currently Amended) A method as in Claim 1 wherein the cryopump further includes first and second stage arrays cooled by a refrigerator, the second, colder stage further including the condensing and adsorbing surfaces[[surface]].

9. (Original) A method as in Claim 8 wherein a partial pressure of hydrogen inside the second stage array is lower than a partial pressure of hydrogen outside the second stage array.

10. (Currently Amended) A method as in Claim 1 wherein determining an adsorption capacity of the adsorbent using the measured pressure further ~~comprising~~ includes determining whether the adsorbent has reached its ~~a pumping~~ adsorption capacity ~~of the cryopump~~ using the measured pressure.

11. (Currently Amended) A method as in Claim 8 wherein determining an adsorption capacity of the adsorbent using the measured pressure further includes ~~predicting~~ determining an adsorption ~~a pumping~~ capacity for ~~low-boiling-point~~ non-condensable gases based on the measured pressure.

12. (Currently Amended) A method as in Claim 1 wherein determining an adsorption capacity of the adsorbent using the measured pressure further ~~comprising~~ comprises determining [[an]] a residual adsorption capacity of the cryopump using the measured pressure.

13. (Currently Amended) A cryopump comprising:

a closed cycle refrigerator;

a condensing surface cooled by the refrigerator; [[and]]

a pressure gauge ~~in fluid communication with~~ sensing pressure in [[a]] an inner vacuum region behind the condensing surface, the inner vacuum region including an adsorbent; and

the sensed pressure being substantially less than the pressure in an outer vacuum region outside of the condensing surface.

14. (Original) A cryopump as in Claim 13 wherein the pressure gauge is an ion gauge.

15. (Currently Amended) A cryopump as in Claim 13 wherein the pressure gauge is connected to a tube or duct leading to the in the inner vacuum region behind the condensing surface.

16. (Currently Amended) A cryopump as in Claim 13 wherein gases are adsorbed within the condensing surface, the adsorbed gases consisting substantially of ~~low-boiling-point~~ non-condensable gases.

17. (Currently Amended) A cryopump as in Claim 16 wherein the ~~low-boiling-point~~ non-condensable gases include at least one of hydrogen, helium or neon.

18. (Currently Amended) A cryopump as in Claim 13 wherein the inner vacuum region behind the condensing surface has a pressure which is at least one order of magnitude less than a process chamber coupled to the cryopump.

19. (Currently Amended) A cryopump as in Claim 13 further includes first and second stage arrays cooled by the refrigerator, and the second, colder stage further including the condensing and adsorbing [[surface]] surfaces.

20. (Original) A cryopump as in Claim 19 wherein the condensing surface of the second, colder stage further includes:

a second stage cryopanel surrounded by a radiation shield, the cryopanel having an array of baffles coated with an adsorbent, the baffles being coupled to and in close thermal contact with a heat sink on the second, colder stage.

21. (Original) A cryopump as in Claim 19 wherein a partial pressure of hydrogen inside the second, colder stage is less than a partial pressure of hydrogen outside the second, colder stage.

22. (Currently Amended) A cryopump as in Claim [[13]] 20 further comprising an electronic controller which measures pressure with the pressure sensor, the controller including computer program instructions which determine whether the adsorbent has reached its adsorption ~~a pumping~~ capacity based on the measured pressure.

23. (Currently Amended) A cryopump as in Claim 22 wherein the controller further includes instructions to ~~predict~~ determine an adsorption ~~a pumping~~ capacity of the cryopump for ~~low-boiling point~~ non-condensable gases based on the measured pressure.

24. (Currently Amended) A cryopump as in Claim 13 further comprising an electronic controller which measures pressure with the pressure sensor, the controller including computer program instructions which determine [[an]] a residual adsorption capacity for the condensing surface using the measured pressure.

25. (Currently Amended) A system for measuring fullness of a cryopump comprising:

a means for coupling a pressure gauge in fluid communication with [[a]] an inner vacuum region behind a condensing surface, the inner vacuum region including an adsorbent for adsorbing non-condensable gases in [[of]] a cryopump; [[and]]

a means for measuring pressure of the inner vacuum region with the pressure gauge, the measured pressure being substantially less than the pressure in an outer vacuum region outside of the condensing surface; and

a means for determining an adsorption capacity of the adsorbent using the measured pressure.

26. (Currently Amended) A method of measuring fullness of a cryopump comprising:

connecting a pressure gauge in fluid communication with [[a]] an inner vacuum region enclosed by cryopumping surfaces, the cryopumping surfaces including an adsorbent for adsorbing non-condensable gases; [[and]]

measuring pressure of the inner vacuum region with the pressure gauge, the measured pressure being substantially less than the pressure in an outer vacuum region; and

determining an adsorption capacity of the adsorbent using the measured pressure.

27. (Original) A method according to Claim 26 wherein the pressure gauge is an ion gauge.

28. (Currently Amended) A method according to Claim 26 wherein connecting the pressure gauge in fluid communication with the inner vacuum region includes

connecting the pressure gauge to a tube or duct leading to the in the inner vacuum region.

29. (Currently Amended) A method according to Claim 26 further including adsorbing gases at the cryopumping surfaces of the cryopump, the adsorbed gases consisting substantially of ~~low-boiling-point~~ non-condensable gases.

30. (Currently Amended) A method according to Claim 29 wherein the ~~low-boiling-point~~ non-condensable gases include any of hydrogen, helium or neon.

31. (Currently Amended) A method according to Claim 26 wherein the inner vacuum region enclosed by cryopumping surfaces has a pressure which is at least one order of magnitude less than a process chamber coupled to the cryopump.

32. (Original) A method according to Claim 26 wherein the cryopumping surfaces further include an array of baffles coated with an adsorbent.

33. (Currently Amended) A method according to Claim 26 wherein the cryopump further includes first and second stage arrays cooled by a refrigerator, the second, colder stage further including condensing [[cryopumping]] and adsorbing surfaces.

34. (Original) A method according to Claim 33 wherein a partial pressure of hydrogen inside the second stage array is less than a partial pressure of hydrogen outside the second stage array.

35. (Currently Amended) A method according to Claim 26 wherein determining an adsorption capacity of the adsorbent using the measured pressure further ~~comprising~~ comprises determining whether the adsorbent has reached its adsorption ~~a pumping~~ capacity ~~of the cryopump~~ using the measured pressure.

36. (Currently Amended) A method according to Claim 35 wherein determining an adsorption capacity of the adsorbent using the measured pressure further includes ~~predicting~~ determining an adsorption ~~a pumping~~ capacity for ~~low-boiling-point~~ non-condensable gases based on the measured pressure.

37. (Currently Amended) A method according to Claim 26 wherein determining an adsorption capacity of the adsorbent using the measured pressure further ~~comprising~~ comprises determining [[an]] a residual adsorption capacity of the cryopumping surfaces using the measured pressure.

38. (Currently Amended) A cryopump comprising:

a cooled condensing surface coated with an adsorbent for adsorbing non-condensable gases; and

a pressure gauge ~~in fluid communication with a~~ sensing pressure in an inner vacuum region enclosed by the condensing surface, the sensed pressure being substantially less than the pressure in an outer vacuum region outside the condensing surface.

39. (Original) A cryopump according to Claim 38 wherein the pressure gauge is an ion gauge.

40. (Currently Amended) A cryopump according to Claim 38 wherein the pressure gauge is connected to a tube or duct leading to the in the inner vacuum region enclosed by the condensing surface.

41. (Currently Amended) A cryopump according to Claim 38 wherein ~~condensing surface~~ the adsorbent is used to adsorb gases, the adsorbed gases consisting substantially of ~~low-boiling-point~~ non-condensable gases.

42. (Currently Amended) A cryopump according to Claim 41 wherein the ~~low-boiling-point~~ non-condensable gases include at least one of hydrogen, helium or neon.

43. (Currently Amended) A cryopump according to Claim 38 wherein the inner vacuum region enclosed by the condensing surface has a pressure which is at least one order of magnitude less than a process chamber coupled to the cryopump.

44. (Currently Amended) A cryopump according to Claim 38 further includes first and second stage arrays cooled by the refrigerator, and the second, colder stage further including the condensing ~~surface.~~ and adsorbing surfaces.

45. (Original) A cryopump according to Claim 44 wherein the condensing surface of the second, colder stage further includes:

a second stage cryopanel surrounded by a radiation shield, the cryopanel having an array of baffles coated with an adsorbent, the baffles being coupled to and in close thermal contact with a heat sink on the second, colder stage.

46. (Original) A cryopump according to Claim 45 wherein a partial pressure of hydrogen inside the second, colder stage is less than a partial pressure of hydrogen outside the second, colder stage.

47. (Currently Amended) A cryopump according to Claim 38 further comprising an electronic controller which measures pressure with the pressure sensor, the controller including computer program instructions which determine whether the adsorbent has reached its adsorption ~~a pumping~~ capacity based on the measured pressure.

48. (Currently Amended) A cryopump according to Claim 46 wherein the controller further includes instructions to ~~predict~~ determine an adsorption ~~a pumping~~ capacity ~~of the cryopump~~ for ~~low-boiling point~~ non-condensable gases based on the measured pressure.

49. (Currently Amended) A system for measuring fullness of a cryopump comprising:

a means for connecting a pressure gauge in fluid communication with [[a]] an inner vacuum region enclosed by cryopumping surfaces, the cryopumping surfaces including an adsorbent for adsorbing non-condensable gases; [[and]]

a means for measuring pressure of the inner vacuum region with the pressure gauge, the measured pressure being substantially less than the pressure in an outer vacuum region; and

a means for monitoring an adsorption capacity of the adsorbent using the measured pressure.

50. (New) A method as in Claim 1 wherein the pressure sensor measures the pressure of non-condensable gases without sensing the cryopump total pressure.

51. (New) A cryopump as in Claim 13 wherein the pressure sensor measures the pressure of non-condensable gases without sensing the cryopump total pressure.

52. (New) A method as in Claim 26 wherein the pressure gauge measures the pressure of non-condensable gases without sensing the cryopump total pressure.

53. (New) A cryopump as in Claim 38 wherein the pressure gauge measures the pressure of non-condensable gases without sensing the cryopump total pressure.

54. (New) A cryopump as in Claim 38 further comprising an electronic controller which measures pressure with the pressure sensor, the controller including computer program instructions which determine a residual adsorption capacity for the condensing surface using the measured pressure.